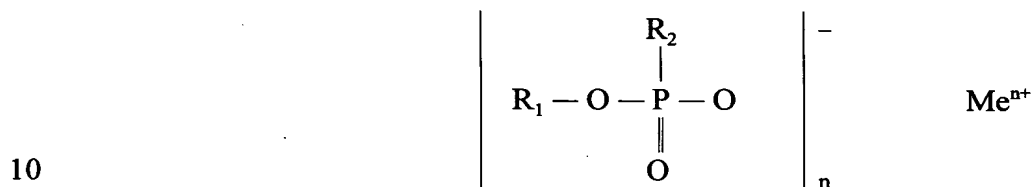


# CLAIMS

What is claimed is:

1. A composition for preventing and controlling fungicidal and bacterial diseases in plants, said composition comprising effective amounts of:

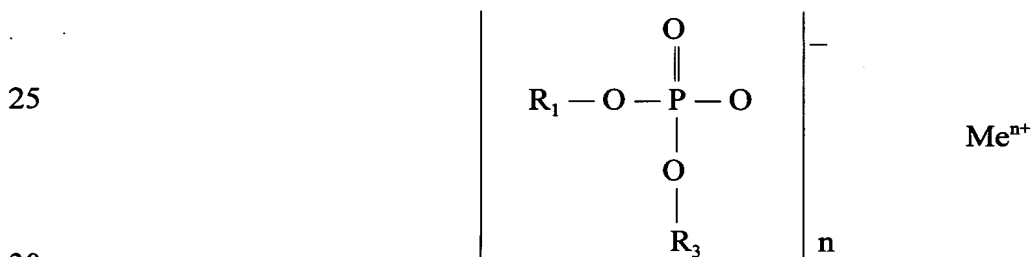
5 (a) at least one first salt having the following formula:



(b) at least one second salt selected from compounds having the formula:



or the formula:



where  $\text{R}_1$  is selected from the group consisting of H, K, an alkyl radical containing from 1 to 4 carbon atoms, halogen-substituted alkyl or nitro-substituted alkyl radical, an alkenyl, halogen-substituted alkenyl, alkynyl, halogen-substituted alkynyl, alkoxy-substituted alkyl radical, ammonium substituted by alkyl or hydroxy alkyl radicals;

$\text{R}_2$  and  $\text{R}_3$  are selected from the group consisting of H and K;

Me is selected from the group consisting of K, alkaline earth metal cations, an aluminum atom, and an ammonium cation;

40 n is a whole number equal to between 1 and 3, equal to the valence of Me; and

(c) at least one metal chelate wherein said metal is a metal selected from rows 4 or 5 of the periodic table of the elements.

2. The composition of Claim 1 wherein said metal chelate is present in said aqueous solution in amount equal to from about 0.01 to about 2 pounds AI per  
5 acre.

3. The composition of Claim 2 wherein said metal chelate is present in said aqueous solution in amount equal to from about 0.01 to about 0.8 pounds AI per acre.

4. The composition of Claim 1 wherein said metal is a metal selected  
10 from row 4 of the periodic table of the elements.

5. The composition of Claim 1 wherein said metal chelate has a solubility equal to about 100% where at least 80 pounds of said metal chelate are dissolved in 100 gallons of water at 50° C.

6. The composition of Claim 1 wherein said metal chelate is added as an  
15 aqueous solution containing an amount of metal chelate (on a metal basis) equal to between 1% and 5% by weight of the aqueous solution.

7. The composition of Claim 1 wherein said metal constituent is selected from the group consisting of iron, zinc, tin, manganese, copper, and combinations thereof.

20 8. The composition of Claim 7 wherein said metal constituent is selected from the group consisting of zinc, manganese, copper, and combinations thereof.

9. The composition of Claim 8 wherein said metal chelate is selected from the group consisting of Cu-EDDHA, Cu-pEDDHA, Cu-EDDHMA, and combinations thereof.

25 10. The composition of Claim 1 wherein said chelate constituent is selected from the group consisting of pEDDHA, EDDHA, and EDDHMA.

11. The composition of Claim 1 wherein said first salt is selected from the group consisting of  $K_2HPO_3$ ,  $KH_2PO_3$ ,  $(NH_3)H_2PO_3$ , and  $(NH_3)_2HPO_3$ ; and said second salt is selected from the group consisting of  $K_2HPO_4$ ,  $KH_2PO_4$ ,  $K_3PO_4$ ,

$(NH_3)_2HPO_4$ ,  $(NH_3)H_2PO_4$ , and  $(NH_3)_3PO_4$ .

5 12. The composition of Claim 1 wherein said composition is in an aqueous solution, wherein each said first and second salt is present in solution from about 0.1 millimolar to about 1000 millimolar.

13. The composition of Claim 12 wherein said composition is in an aqueous solution, wherein each said first and second salt is present in solution from  
10 about 20 millimolar to about 200 millimolar.

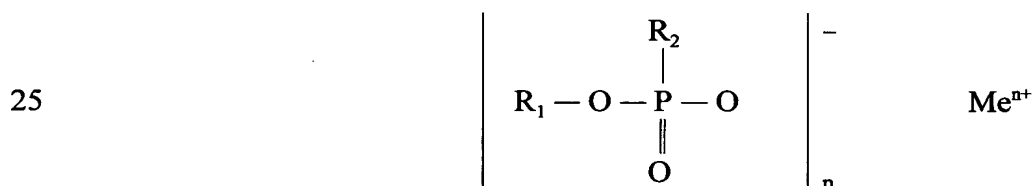
14. The composition of Claim 1 wherein the weight ratio of said first salt to said second salt is 1:0.001 to 1:1,000.

15. The composition of Claim 1 wherein said composition treats or prevents diseases caused by *Phytophthora*.

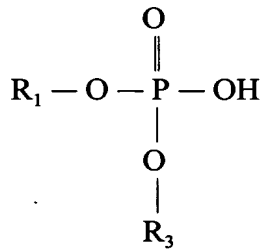
15 16. The composition of Claim 15 wherein said composition treats or prevents diseases caused by *Phytophthora infestans*.

17. The composition of Claim 1 wherein the plants are tomato and potato species.

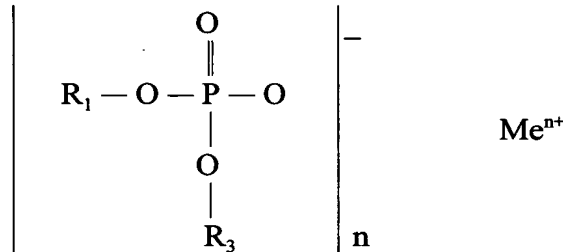
18. A method for controlling fungicidal and/or bacterial disease wherein  
20 said method comprises applying to a plant fungicidally and/or bactericidally effective amounts of at least one metal chelate, at least one phosphate salt, and at least one phosphonate salt in aqueous solution, wherein said phosphonate salt has the formula:



said phosphate salt is selected from compounds having the formula:



or the formula:



where  $\text{R}_1$  is selected from the group consisting of H, K, an alkyl radical containing from 1 to 4 carbon atoms, halogen-substituted alkyl or nitro-substituted alkyl radical, an alkenyl, halogen-substituted alkenyl, alkynyl, halogen-substituted alkynyl, alkoxy-substituted alkyl radical, ammonium substituted by alkyl or hydroxy alkyl radicals;

$\text{R}_2$  and  $\text{R}_3$  are selected from the group consisting of H and K;

Me is selected from the group consisting of K, alkaline earth metal cations, an aluminum atom, and an ammonium cation;

$n$  is a whole number equal to between 1 and 3, equal to the valence of Me; and said metal is a metal selected from rows 4 or 5 of the periodic table of the elements.

19. The method of Claim 18 wherein said metal chelate is present in said aqueous solution in amount equal to from about 0.01 to about 2 pounds AI per acre.

20. The method of Claim 19 wherein said metal chelate is present in said aqueous solution in amount equal to from about 0.01 to about 0.8 pounds AI per acre.

21. The method of Claim 18 wherein said metal is a metal selected from row 4 of the periodic table of the elements.

22. The method of Claim 18 wherein said metal chelate has a solubility equal to about 100% where at least 80 pounds of said metal chelate are dissolved in 100 gallons of water at 50° C.

23. The method of Claim 18 wherein said metal chelate is added as an aqueous solution containing an amount of metal chelate (on a metal basis) equal to between 1% and 5% by weight of the aqueous solution.

24. The method of Claim 18 wherein said metal constituent is selected from the group consisting of iron, zinc, tin, manganese, copper, and combinations thereof.

25. The method of Claim 24 wherein said metal constituent is selected from the group consisting of zinc, manganese, copper, and combinations thereof.

26. The method of Claim 25 wherein said metal chelate is selected from the group consisting of Cu-EDDHA, Cu-pEDDHA, Cu-EDDHMA, and combinations thereof.

27. The method of Claim 18 wherein said chelate constituent is selected from the group consisting of pEDDHA, EDDHA, and EDDHMA.

28. The method of Claim 18 wherein said first salt is selected from the group consisting of  $K_2HPO_3$ ,  $KH_2PO_3$ ,  $(NH_3)H_2PO_3$ , and  $(NH_3)_2HPO_3$ ; and said second salt is selected from the group consisting of  $K_2HPO_4$ ,  $KH_2PO_4$ ,  $K_3PO_4$ ,  $(NH_3)_2HPO_4$ ,  $(NH_3)H_2PO_4$ , and  $(NH_3)_3PO_4$ .

29. The method of Claim 18 wherein said composition is in an aqueous solution, wherein each said first and second salt is present in solution from about 0.1 millimolar to about 1000 millimolar.

30. The method of Claim 30 wherein said composition is in an aqueous solution, wherein each said first and second salt is present in solution from about 20 millimolar to about 200 millimolar.

31. The method of claim 18 wherein the weight ratio of said first salt to said second salt is 1:0.001 to 1:1,000.

32. The method of claim 18 wherein said composition treats or prevents diseases caused by *Phytophthora*.

33. The method of claim 32 wherein said composition treats or prevents diseases caused by *Phytophthora infestans*.

34. The method of claim 18 wherein the plants are tomato and potato species.

35. A method of controlling fungicidal and/or bactericidal disease in plants comprising applying to the plants in enhanced fungicidally and/or bactericidally effective amounts an aqueous composition comprising:

- (a) an aqueous solution of  $\text{H}_3\text{PO}_3$  and KOH,
- (b) an aqueous solution of monopotassium phosphate and KOH,
- and
- (c) a metal chelate wherein said metal is a metal selected from rows 4 or 5 of the periodic table of the elements.

36. The method of Claim 35 wherein the amount of potassium phosphonate in said aqueous solution (a) and the amount of potassium phosphate in

said aqueous solution (b) is each present in said composition in an amount from about 0.1 millimolar to about 1000 millimolar

37. The method of Claim 35 wherein the weight ratio of potassium phosphonate prepared from solution (a) in said composition to potassium phosphate prepared from solution (b) in said composition is 1:0.001 to 1:1,000.

38. The method of Claim 35 wherein said metal chelate is present in said aqueous solution in amount such that the metal is applied to the plants at a rate of from about 0.01 to about 2 pounds AI per acre.

39. The method of Claim 35 wherein said chelate constituent is selected from pEDDHA, EDDHA, EDDHMA or combinations thereof, and said metal is selected from iron, zinc, tin, manganese, copper, and combinations thereof.

40. A method of controlling fungicidal and/or bactericidal disease in plants comprising applying to the plants in enhanced fungicidally and/or bactericidally effective amounts an aqueous composition prepared by mixing:

- (a) an aqueous solution of  $H_3PO_3$  and KOH,
- (b) an aqueous solution of monopotassium phosphate and KOH,  
and
- (c) a metal chelate wherein said metal is a metal selected from rows 4 or 5 of the periodic table of the elements.

41. The method of Claim 40 wherein the amount of potassium phosphonate in said aqueous solution (a) and the amount of potassium phosphate in said aqueous solution (b) is each present in said composition in an amount from about 0.1 millimolar to about 1000 millimolar

42. The method of Claim 40 wherein the weight ratio of potassium phosphonate prepared from solution (a) in said composition to potassium phosphate prepared from solution (b) in said composition is 1:0.001 to 1:1,000.

43. The method of Claim 40 wherein said metal chelate is present in said aqueous solution in amount such that the metal is applied to the plants at a rate of from about 0.01 to about 2 pounds AI per acre.

44. The method of Claim 40 wherein said chelate constituent is selected from pEDDHA, EDDHA, EDDHMA or combinations thereof, and said metal is selected from iron, zinc, tin, manganese, copper, and combinations thereof.

45. A method of controlling fungicidal and/or bactericidal disease in plants comprising applying to the plants in enhanced fungicidally and/or bactericidally effective amounts an aqueous composition comprising:

- (a) an aqueous solution of  $H_3PO_3$  and KOH,
- (b) an aqueous solution of dipotassium phosphate, and
- (c) a metal chelate wherein said metal is a metal selected from rows 4 or 5 of the periodic table of the elements.

46. The method of Claim 45 wherein the amount of potassium phosphonate in said aqueous solution (a) and the amount of potassium phosphate in said aqueous solution (b) is each present in said composition in an amount from about 0.1 millimolar to about 1000 millimolar

47. The method of Claim 45 wherein the weight ratio of potassium phosphonate prepared from solution (a) in said composition to potassium phosphate prepared from solution (b) in said composition is 1:0.001 to 1:1,000.

48. The method of Claim 45 wherein said metal chelate is present in said aqueous solution in amount such that the metal is applied to the plants at a rate of from about 0.01 to about 2 pounds AI per acre.

49. The method of Claim 45 wherein said chelate constituent is selected from pEDDHA, EDDHA, EDDHMA or combinations thereof, and said metal is selected from iron, zinc, tin, manganese, copper, and combinations thereof.

50. A method of controlling fungicidal and/or bactericidal disease in plants comprising applying to the plants in enhanced fungicidally and/or bactericidally effective amounts an aqueous composition prepared by mixing:

- (a) an aqueous solution of  $H_3PO_3$  and KOH,
- (b) an aqueous solution of dipotassium phosphate, and
- (c) a metal chelate wherein said metal is a metal selected from rows 4 or 5 of the periodic table of the elements.



51. The method of Claim 50 wherein the amount of potassium phosphonate in said aqueous solution (a) and the amount of potassium phosphate in said aqueous solution (b) is each present in said composition in an amount from about 0.1 millimolar to about 1000 millimolar

5 52. The method of Claim 50 wherein the weight ratio of potassium phosphonate prepared from solution (a) in said composition to potassium phosphate prepared from solution (b) in said composition is 1:0.001 to 1:1,000.

53. The method of Claim 50 wherein said metal chelate is present in said aqueous solution in amount such that the metal is applied to the plants at a rate of  
10 from about 0.01 to about 2 pounds AI per acre.

54. The method of Claim 50 wherein said chelate constituent is selected from pEDDHA, EDDHA, EDDHMA or combinations thereof, and said metal is selected from iron, zinc, tin, manganese, copper, and combinations thereof.

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